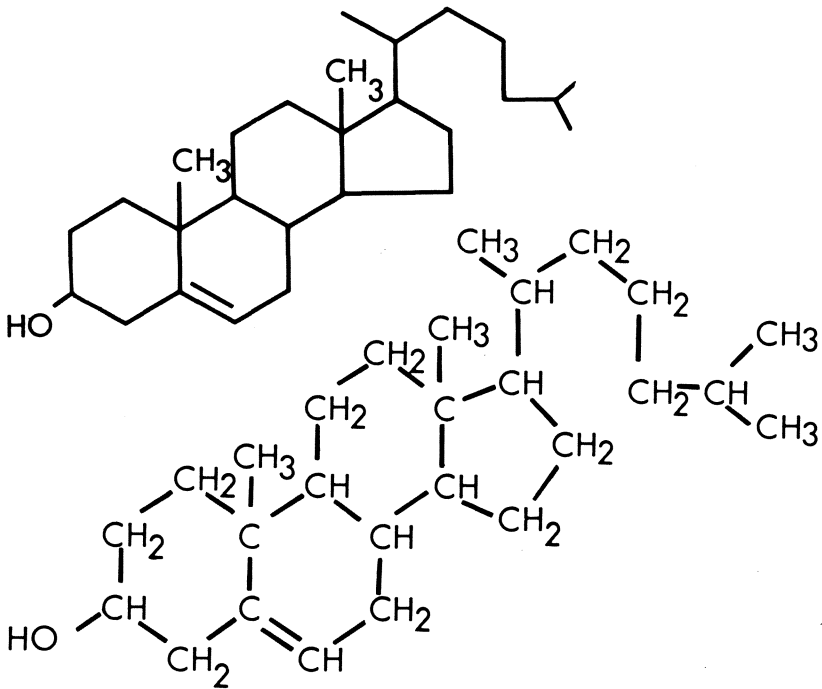


BIBLICAL CREATION



In this issue:

**Thinking Again About Dinosaurs
The Biblical Doctrine of the Flood
Steroid Hormones and Evolution**

Chairman's Letter	129
Thinking Again about Dinosaurs by Brian Newton	130
The Biblical Doctrine of the Flood by Hywel R. Jones	135
Steroid Hormones and Evolution by David B. Gower	149
News	160

Editorial Committee

David C. Watts, PhD, BSc, MInstP, CChem, FRSC, General Editor,
Senior Lecturer in Biomaterials Science,
University of Manchester.

The Revd Nigel M. de S. Cameron, MA, BD, PhD,
Warden of Rutherford House, Edinburgh.

J.H. John Peet, PhD, CChem, FRSC,
Science Coordinator at Guildford County College of Technology.

The Revd John C. Sharp, BSc, BD, PhD,
Minister of the South Parish Church, East Kilbride.

David J. Tyler, MSc, MInstP, ACFI,
Lecturer at Manchester Polytechnic.

B.C.S. Chairman's Letter

Most Christians are aware that the real importance of events in this world cannot be gauged by the extent of media coverage. In one of his parables, Jesus of Nazareth likened the kingdom of God to seed growing secretly. This reminds us of the oft-times hidden work of God, the quiet, diligent, faithful work of his servants and the approaching harvest when the work of the kingdom shall have reached maturity. Our estimate of the strategic importance of 'biblical creation' is not based upon the current degree of interest in either the secular or the Christian press. Rather our concern is kindled by those pregnant words which significantly commence both *Genesis* and the *Fourth Gospel*. Faced with the appalling lostness of so many of our contemporaries we desire to press the claims of God the Creator and only Saviour.

Currently it is apparent that while general media interest in 'creationism' has waned, the issues are still hotly debated in the popular scientific press. Nor are (American) creationists the only target of establishment counter-offensive. In a vituperative book review in *New Scientist* (22/29 December 1983 p. 940 f), Dr. Beverly Halstead slates Sir Fred Hoyle for giving credence to certain creationist arguments. Halstead makes the puerile comment that such considerations have led to Hoyle's 'failure to receive the accolade of Nobel laureate'!

It is evident that strong feelings have been aroused and there is a concerted attempt being made to silence creationist views. At this juncture, however, we should critically evaluate some of the scientific positions that have been advanced in the name of Creationism. In the scientific realm we are neither infallible nor inerrant. There is scope for refining and, in parts, reformulating our scientific creationist position. There is a significant credibility gap to be bridged, if not closed, between creationists and many other sincere Christians — let alone secularists! The Biblical Creation Society is a forum for the necessary meeting of minds, hard work and serving the Lord together. We need each other! Without your prayers, interest, participation and support our society is impoverished. We are thankful for the level of interest aroused by the autumn conferences in London. We hope you will come to the meetings planned for 1984 — especially to the residential conference and open day in July. The relaxed atmosphere of a conference centre provides an excellent opportunity for sharing our mutual concerns, airing our ideas and generally learning from one another. Book the dates in your diary now.

See you there!

David Watts.

THINKING AGAIN ABOUT . . . DINOSAURS!

Brian Newton

Why?

Why think again about Dinosaurs? Why think about Dinosaurs at all? Are they not just a bunch of weird creatures, as dead as the Dodo, and useful only for children's picture books and science-fiction films and, of course, keeping dry-as-dust palaeontologists busy in their museums?

Well, not quite. Anyone with a spark of wonder in his soul has to be fascinated by these strange, sometimes gigantic, always grotesque animals that once walked our earth. How can we gaze at their huge skeletons without a feeling of awe at the mystery of their origins, their way of life . . . and their extinction?

Those who study Dinosaurs closely have lately been producing some remarkable new ideas about them which are rapidly putting all the textbooks out of date. Some discoveries are so astounding that many scientists are shying away from the facts in horror because they know that if these findings are accepted, then whole lives, world-views, philosophies, even careers could be turned upside-down. So it is important to think again about Dinosaurs — there has never been a better time!

The Text-books say . . .

. . . That Dinosaurs were cold-blooded reptiles of a great diversity of types which evolved from simpler forms over vast periods of time.

. . . That they ruled the earth for about 100 million years, at sea, on land and in the air.

. . . That in the end they were so highly specialised that they were unable to adapt to changing conditions and were wiped out. They were one of "nature's" blunders.

. . . That only then did mammals evolve unhindered, eventually giving rise to the primates and Man.

. . . That the last Dinosaur died at least 60 million years before the first man appeared on the earth — inspite of the fact that Hollywood showed us Raquel Welch in a fur bikini being hotly pursued by an *Allosaurus*!

The point is this — and it is a mainstay of the evolutionary view — it is taught that Dinosaur fossils and human fossils are found in completely different

Thinking Again About Dinosaurs: Newton

horizons of rock strata, which separate them by many millions of years. "Cavemen" and Dinosaurs did not live on this earth at one and the same time!

New thoughts on an old subject

Modern scientists are changing their ideas on how the Dinosaurs lived. They are now thought to have been warm-blooded creatures, with efficient mammal-like bodies. Some, like the Brontosaurus, once thought to have been aquatic in their habits, now are believed to have been forest-dwellers and tree-top browsers. Supposed water-plant eaters, like the Duck-billed Dinosaurs are found with pine needles and cones in their fossilised stomachs. It is now known that the flying Pterosaurs were not bare or scaly-skinned, but fur-covered, like bats.

Note also that the ancestors of the Dinosaurs have still not appeared in the fossil record. Each kind of Dinosaur is distinct and never gives evidence of changing into another kind. And this is true, incidentally, of all prehistoric animals. The "links" between kinds are still obstinately missing. The inference is plain enough — there is no proof that they evolved at all!

And so the Dinosaurs take on a fresh life and a new interest for those of us who like to let our imaginations roam the ancient world.

The Find of the Century

The most exciting modern discovery, however, is that Dinosaur and human fossils have now been found together!

At Glen Rose, Texas, the Paluxy river has cut its way into a layer of limestone. Geologists dated this limestone as Cretaceous because in it are found many fossil footprints of dinosaurs. Whole trails of wash-tub size Brontosaurus prints and three-toed Carnosaurus tracks have been traced across the rocky bed and banks of the river. Reports by local farmers that "Man-tracks" could also be found were scoffed at by geologists. An intensive search by Dr. Clifford Burdick, Dr. A.E. Wilder-Smith and other interested scientists discovered trails of human foot-prints in the same rock as the Dinosaur prints. These appear to be genuine fossil foot-prints of human adults and children, by every test which can be applied. As one sceptical scientist commented, "I would not doubt that these are human foot-prints, except that they are in Cretaceous strata." Obviously, if men and Dinosaurs walked in the same mud long ago, leaving their tracks to be fossilised as the mud changed to limestone, then geological science has some rethinking to do. The time-scale of millions of

years collapses to mere thousands and the theory of evolution becomes an exploded fantasy that has misled us for a century and a quarter.

Awkward facts explode theories

These fossil human foot-prints “in the wrong place” are by no means unique. Similar prints are turning up in rocks of other geological “periods” besides the Cretaceous. For example, there is a beautiful fossil *shoe* print discovered by W. Meister in the Cambrian rocks of Utah. This print clearly shows two fossil trilobites embedded in the sole and heel impressions!

To this we can add the long list of discoveries of fossil human skulls and other bones in strata far too “early” for the evolutionary story. Then there are artefacts, such as a gold chain found inside a chunk of coal, an iron pot in a coal seam, an engraved silver-alloy cup in solid conglomerate and an iron nail enclosed in quartz. Scientists can do nothing with these freak fossils which destroy the evolutionary world-picture. Needless to say, if only one of these finds is a true fact, then it destroys — not true experimental science — but those pseudo-scientific speculations which lean heavily upon unproven assumptions instead of hard facts.

Is there a framework of thought which can make sense of Dinosaurs and Man, as well as a host of other hitherto pre-historic creatures, living together in a world which is relatively young and in which evolution “From *Amoeba* to Man” never took place?

The Ancient World

There most assuredly is such a framework. The Bible clearly states that God created the earth in six days, furnishing it with plants and animals that would breed “after their kind” — i.e. they would not change into other kinds, — and making it a home for mankind. It provides us with a picture of an early world teeming richly with an amazing diversity of plant and animals kinds, which included Dinosaurs and Man!

The Genesis record later describes in some detail how this ancient earth was completely destroyed by a global catastrophe; an immense deluge — the Noachian flood (Genesis 7 and 8). The early geologists recognised that this flood was the mechanism that could account for the world-wide layers of sedimentary rock, within which are enclosed the fossil remains of millions of plants and animals. This *catastrophic* geology was superseded by the *uniformitarian* theory of Sir Charles Lyell. This called for slow, present-day

Thinking Again About Dinosaurs: Newton

rates of deposition for sediments and therefore required many millions of years to account for the observed layers of rock — and, of course, for the age of the earth. Modern geology is coming to realise, however, that the sedimentary record is, after all, one of catastrophe, sudden death and violent crustal movements. After such a catastrophe as the Flood, we would expect world geography and climate to be drastically altered. Many animals and plants would not survive for long in the new environment: others would flourish and fill the barren lands. Did any Dinosaurs live on? There is evidence that some could have done so.

Certain American and African rock-drawings and Cave-paintings show remarkably dinosaur-like shapes which the artists presumably drew from the living animals. Legends and tales of dragons are common in many countries, and the descriptions again remind us strongly of the Dinosaurs. The Bible itself refers to “dragons” several times and in the book of Job, chapter 40 and 41, detailed descriptions are given of “leviathan” and “behemoth,” two mighty monsters which bear scant resemblance to hippos, elephants and crocodiles, but which could fit the part of surviving types of Dinosaur. Today we have many reports of the sighting of unknown marine monsters — loosely called “sea serpents” — which could conceivably be surviving Dinosaurs. Even lakes are not free of such sightings, although the Loch Ness monster stubbornly refuses to be found and a recent expedition to the great African lakes has returned empty-handed.

Food for Thought

What have we learned in thinking again about Dinosaurs? Perhaps most important is the discovery that there is clear evidence that Man and the Dinosaurs lived on this earth at the same time. And this, in turn, is fully consistent with the Bible's own teaching in the book of Genesis that God created the world and mankind in a mighty outpouring of creative power at the very beginning. And the God who reveals Himself in His works of Creation and providence, and in His Word, is the God who is dealing with mankind throughout history. The Scriptures state that man's rebellion against his Creator brought evil and violence into a once perfect world. Cleansed by the Flood, this world is now once more, and after only a few thousand years, giving evidence of being ripe for the judgment of God. We don't have these millions of years, beloved by the evolutionist, behind us . . . and we don't have them ahead of us either!

But God is gracious! The Creator reaches out in love to His world in the person of the Lord Jesus Christ, the only Saviour of sinners. Shall we turn in repentance toward God and faith in our Lord Jesus Christ and receive the gift

of eternal life . . . or shall we, like the world before the Flood, perish in our sins?

Think again!

Brian Newton

For further reading:

John Morris, *Tracking those Incredible Dinosaurs*, Creation Life Publishers.
Duane T. Gish, *Evolution — the Fossils say 'No!'* Creation Life Publishers.

These books and a wide range of Creationist literature are available from The Biblical Creation Society.

THE BIBLICAL DOCTRINE OF THE FLOOD

Hywel R. Jones

The aim of this article is to discover what the Bible teaches about the Flood. This necessitates a consideration of New Testament as well as Old Testament passages. While particular attention will be given to the *extent* and the *effects* of the Flood, we commence by saying something about the Flood as an event and conclude by presenting its theological significance. The main sources of relevant material are, in the Old Testament, Genesis 6-8; Psalm 29 & 104: 5-9; also Job 22:15-17 and Isaiah 54:9. And, in the New Testament, Matthew 24:37-39 (Luke 17:26-27), Hebrews 11:7; I Peter 3:18-22 and II Peter 3:5-7.

I. THE EVENT OF THE FLOOD

If the Flood were referred to as an event in only one passage of the Old Testament, then that should make its historicity certain to Christian people. As it is, there are many references, found in both Testaments — in the historical, poetic and prophetic literature of the Old Testament and also in narrative and prophetic sections of the New — and all with a didactic purpose. The crowning reference is to be found in the words of the Lord Jesus Christ in Matthew 24:37-39:

“As it was in the days of Noah, so it will be at the coming of the Son of Man. For in the days before the Flood, people were eating and drinking, marrying and giving in marriage, up to the day Noah entered the ark; and they knew nothing about what could happen until the Flood came and took them all away. That is how it will be at the coming of the Son of Man.” (N.I.V.)

In these words, historical, prophetic, didactic and practical elements combine. Here alone is more than enough to settle the question as to whether the Flood was an event in time and space.

It ought to be made clear that there are perfectly adequate answers to the arguments which are presented against the trustworthiness of this Biblical material and of Genesis 6-8 in particular. These arguments are divisible into two main categories. First, there is the character of the period in which the Flood is presented as having occurred. Second, there are the features of the accounts themselves which indicate both diversity of authorship and factual inconsistencies. As the historicity of the Flood is basic and necessary to its theology, we shall reply briefly to these allegations.

1. The Period

The narrative of the Flood is found in the opening section of the Old Testament, i.e. Genesis 1-11. Many Old Testament scholars refer to this period as that of Israel's "pre-history" — only feeling themselves to be on surer ground with the call of Abram. To such, this earlier period is vague, shadowy and folkloristic. To them the Flood becomes a fable. They refer to the Flood myths of other nations and treat Genesis 6-8 accordingly.

It can be confidently replied that the existence of these other stories of a Flood and even the similarities between some and the Genesis account (the Babylonian Gilgamesh epic in particular) are strong corroborating witnesses of the time-space actuality of the Flood rather than the reverse.¹ That such an incident should be known and attested to by so many diverse people says something at least in its favour as an event. Frederick Filby has two chapters on extra-Biblical Flood stories in his book *The Flood Reconsidered* together with extensive footnotes and references. After making due allowances for the dissemination of the Genesis story by Jews and Christians and for accounts of other floods which occurred at various times and in various places, he can still say,

"The Flood story has indeed reached to the ends of the Earth. It extends across Asia from Turkey to Siberia, China, Japan and Indonesia. It is found in Australia, New Zealand and the Islands of the Pacific. It is prolific in its various forms in both North and South America, from Alaska to Tierra del Fuego. It is rarer in Africa though yet to be found from Egypt to Nigeria and from the Congo to the Cape. Finally, it has crossed Europe from Greece to Ireland and Iceland . . . There is no other story of an ancient event in all the world so widely accepted. The cumulative weight of this evidence is that the present human race has spread from one centre and even from one family — a family who themselves experienced the great Deluge of which every story speaks."²

2. The Accounts

Derek Kidner writes:

"Genesis 6-8 is one of the showpieces of literary criticism, a textbook example of the art of detecting and unravelling a composite narrative."³

Three sets of contradictions in the Flood narrative are alleged and these are said to reflect the multiple authorship of the chapters. They relate to the number of animals taken into the ark, the duration of the Flood and the means

The Biblical Doctrine of the Flood: Jones

by which the Flood was produced. Each of these will be treated below and some data regarding the Flood will be introduced as well.

3. *The number of animals taken into the ark.*

According to Genesis 6:19, Noah is commanded to bring one pair of every kind of living creature into the ark, whereas according to Genesis 7:2, he is to take seven or seven pairs of each kind of clean creature and one pair of unclean. Here it is claimed is the first contradiction. But there is no substance in the claim. If it were recorded in chapter 7 that seven pairs of *every* kind were to be taken then that would be a contradiction in terms. As it is from chapters six and seven, only one pair of each kind of *unclean* animal was to be taken. What we have with regard to clean animals in Chapter seven is extra information to that given in chapter six. This is by way of addition not contradiction. As the differentiation between clean and unclean suggests this was doubtless with that sacrifice in view which Noah is recorded as offering in Genesis 8:20.

4. *The duration of the Flood*

It is maintained from Genesis 7:4, 12 and 8:6-12 that, on the one hand, the Flood lasted no more than 40 days plus three seven-day periods in which the raven and dove were sent out and, on the other hand, one year and ten days as per Genesis 7:11 and 8:13.

It is this latter computation which is correct. The evidence for the shorter period is wrongly regarded as relating to the entire duration of the Flood instead of to various stages in the flooding. From the data given in Genesis 7 and 8, a table of events has been compiled by Derek Kidner which demonstrates what he calls "the self-consistency of the account."⁴

<i>Refs. in Genesis</i>	<i>Events</i>	<i>Yr. of Noah's Life</i>
7:11	Flood Begins	17. 2.600
7:12 c/f v. 17	Cataclysm till 40th Day	26. 3.600
7:24 c/f 8:3	Inundation till 150th Day	16. 7.600
8:4	Ark Aground	17. 7.600
8:5	Hill Tops Visible	1. 10.600
8:6 + 7	Raven Sent	10. 11.600
8:8	Dove Sent	17. 11.600
8:10 + 11	Dove and Leaf	24. 11.600
8:12	Dove Departs	1. 12.600

8:13	Ground appears Dry	1. 1.601
8:14	Disembarking	27. 2.601

5. The means by which the Flood was produced

In Genesis 7:11-12, two causes of the Flood are presented and it is suggested that both cannot be true. On the one hand the “fountains of the great deep” were fractured and the “windows of Heaven” were opened, whereas on the other there was a downpour. There is no necessary conflict here. Rain came from above *and* water from beneath to bring about the Flood.

The conclusion which can be drawn from all this is that there is no warrant for saying that the account of the Flood is full of obvious inconsistencies and cannot, therefore, be accepted as historical. Before leaving this section, some brief references ought to be made to the date of the Flood. It is not possible with the Biblical data available and our present knowledge to determine this. The genealogy in Genesis 5 cannot be regarded as being absolutely complete and no date for the Flood is given in relation to other dated incidents in the Old Testament. The fact that, as we have seen, it is dated in terms of Noah’s lifespan and that his historicity is asserted in many places in Scripture means that the Flood *has* to be regarded as historical. Support for this assertion comes from the feasibility of the ark for the purpose designated and the suitability of its dimensions.

II THE EXTENT OF THE FLOOD

In discussing the extent and effects of the Flood, our task is to determine what the Genesis narrative actually teaches. When we have done that, we shall be better able to assess any scientific view of the Flood. Many scientists have indeed dismissed the whole account as quite improbable. Bernard Ramm reminds us that the Flood is “one of the sharpest centres of controversy in the history of the warfare of theology and science.”⁵ My intention in this section is the pursue the meaning of the Biblical data. This is primary for everyone, whether one has a scientific training or not.

Three views are taken on this subject. First, the Flood is regarded as only having been local to Mesopotamia. Second, it is regarded as having been much more widespread than that. Third, there are those who regard it as having been universal. It is, of course, the difference between the first two and the third of these views which points up the issue and debate over the extent

of the Flood. We, therefore, discuss this matter by seeking to answer the question “Was the Flood worldwide?”

It has to be unequivocally affirmed at the outset (and this has been done in the Church down through the ages) that there are statements in the Genesis account which, if taken in their most obvious sense, answer the question for us quite definitely and in the affirmative. Many scholars who do not adopt a universal view admit this in the light of Genesis 6:12, 13; 17b; 7:4 and especially 7:18-24, e.g. Meredith Kline⁶, Derek Kidner⁷ and T.C. Mitchell.⁸ The latter writes:

“The text is also capable of bearing the interpretation of a universal Flood and dogmatism is not reasonable either way.”

However, all these writers and others, e.g. Bernard Ramm, have serious reservations about the propriety of that interpretation of Genesis 7 and 8 which points to a universal flood. In this they may be taken as representative of large sections of evangelical scholarship today. On what grounds do they do this? Here we are not considering arguments about geology which are presented against a universal Flood and Biblical catastrophism. Whatever science may or may not say, the former by dismissal and the latter by withholding confirmation, the precedence rests solely and satisfactorily with what Scripture teaches. If this can be established then true science will be validated and science falsely so-called will be exposed.

1. The Arguments for a Local Flood

There are two arguments which form the exegetical basis for this limited view of the extent of the Flood. These are as follows:

- A. The fact that the terms used to describe the Flood in Genesis 7, which seem to necessitate a universal scope of reference, are used elsewhere in the Bible in a more restricted way. This, we may call, the *Problem of Universal Language*.
- B. The claim that the account in which they occur is presented from the standpoint of the perspective of the writer and this matter must determine the interpretation of any statement expressed. This we will call the *Problem of the Perspective of the Writer*.

While these two grounds are interconnected, I believe that it is worth separating them because the former is not as far-reaching as the latter. The former only concerns the meaning of specific words and phrases while the latter is almost raised to the status of a general principle of interpretation

which will affect one's understanding of other passages of scripture — and may even come to affect one's doctrine of the nature of Holy Scripture as an entity.

Let us consider the *Problem of Universal Language* first. On this no less an authority than E.J. Young has written:

"The account of the Flood is told in terms of universality. This does not necessarily mean that the flood covered the entire face of the globe. Rather, it was universal in that it destroyed all flesh. If the habitations of mankind were limited to the Euphrates valley, it is quite possible that the Flood was also limited."¹⁰

A good example of terms bearing a more restricted meaning than they seem at first to require is found in Genesis 41:56, 57. However, verse 56 could be translated either "the land" and "the land of Egypt" or "the earth" and "the land of Egypt". Verse 57 has to be rendered "all the earth (countries in N.I.V.) came to Egypt to Joseph to buy grain for the famine was severe over all the earth (world in N.I.V.)." The question which arises is the extent of the term "earth" in verse 57. Is it quite literally universal or not? If some restriction of scope is called for, and it would seem to be, then why not a similar restriction of the term's scope in the Flood narrative of Genesis 7? The same holds good for "heaven" as for "earth". Heaven can mean "sky", i.e. the visible part overhead and to the horizon, e.g. I Kings 18:45 where, in response to Elijah's fervent prayer, "the sky (heaven) grew black with clouds and wind."

Without dismissing or even questioning such an exegetical approach to the meaning of words, it must be remembered that the important question in determining the meaning of a term is not what meanings it has within its permitted range, nor what it may and does mean in other passages of Scripture. Rather, the question is what does it mean *in the context in which it occurs*, i.e., in the narrower context of the passage in which it is found and also the larger context of the entire Scripture in which the subject treated in the narrower context is referred to. "What does 'the earth' mean in Genesis 7?" is the question and not in Genesis 41. And further, what does it mean in any other passage, even in the New Testament, where the Flood is referred to?

Before examining these terms, let us refer to the other problem viz. that of the perspective of the writer being the decisive factor in the correct interpretation of any statement. The perspective of the writer or the original intention of the author is quite elusive apart from the words used. To read anyone's thoughts is a hazardous business; to disregard his words in an attempt to do so is either folly or arrogance, or both. To be quite fair, those who emphasize this

approach do not disregard the words used, but what they may be guilty of doing, unconsciously, or under the pressure of some scientific, philosophical or theological theory, is transferring *their thoughts* to the original writer and reading his words in that light. So the tail (the interpreter) wags the dog (the text). Take for example the way in which Bernard Ramm uses this argument to support his case for a local flood. He writes “the universality of the flood simply means the universality of the experience of the man who reported it.”¹¹ This is to ignore the stress of Genesis 7:19 which says that “*all* the high mountains under *all* the heavens were covered” and by so doing, he gives the impression that he has made geological considerations (i.e. that a world-wide flood is impossible to envisage scientifically) and not the meaning of the text, the ultimate arbiter of Scripture.

It is at this point too that one’s doctrine of Scripture may become involved and affected for the worse. All that comprises the uniqueness of Scripture has been predicted of it “as originally given” and not of it “as originally intended”. These two expressions are not synonymous and they carry very different implications. It is vital they should be kept distinct in our thinking. “As originally given” refers to something objective, i.e. something apart from both the writer and the interpreter. “As originally intended” involves not only the mind of the writer (which was, of course, involved in the production of Holy Scripture), but also, and most importantly for our purpose just now, the mind of the interpreter seeking to understand the mind of the writer. This is subjective and also open to uncertainty and error. To affirm inspiration in these terms will result in the loss of infallibility.

I am seeking neither to diminish the importance of the original meaning nor deny the importance of interpretation, but to say that whereas “as originally given” can only refer to the inerrant Word of God, “as originally intended” may come to refer to something else, namely the erroneous views of man. To regard what we read in Genesis 7 as necessarily limited to the range of the author’s knowledge of observation, as many evangelical commentators do, is to forget that writers of Scripture often wrote more than they understood or saw, cf. Daniel 12:9 and I Peter 1:11. This was because they were recipients of divine truth which was greater than they could perceive, observe or verify. Yet their inspired writing expresses it.

In the light of all this, what should be said about the extent of the Flood? There is something which ought to be in no doubt at all and it is that the Flood was universal as far as mankind was concerned. We are told that “everything on dry land that had the breath of life in its nostrils died” (Genesis 7:22 and 23). That this was so is not only stated, but necessitated by the divinely declared cause of the Flood. It was due to human sin (Genesis 6:5, 6), abnormal (6:1-

4)¹², unceasing and increasing and as prevalent as the human race was distributed (6:11). Apart from these facts, the Flood would not have occurred and in turn, the Flood was sent to deal with them. It did. The entire human race, wherever any members of it were to be found, was destroyed with the exception of eight people and no more (Genesis 6:18 and I Peter 3:20). By the time of the Flood, the human race had begun to increase (6:1) and not just from Adam and Eve, but from many of their descendants over a period of at least one thousand years (Genesis 5). The geographical distribution of the race before the Flood has to be determined on extra-Biblical grounds and there is evidence which points to its having spread well beyond Mesopotamia.

But was the Flood universal as far as the earth was concerned? Genesis 7:19 and 20 can be selected as the verses which, in particular, bear upon this matter. In any reading of them it is hard to avoid the sense that the author is striving to emphasize something. He uses the word “all” twice in these verses. Leupold comments on this feature as follows:

“A measure of the waters is now made by comparison with the only available standard for such waters — the mountains. They are said to have been ‘covered’. Not a few merely, but ‘all the high mountains under all the heavens’. One of these expressions alone would almost necessitate the impression that the author intends to convey the idea of the absolute universality of the Flood, e.g. ‘all the high mountains’. Yet, since “all” is known to be used in a relative sense, the writer removes all possible ambiguity by adding the phrase ‘under all the heavens’. A double all cannot allow for so relative a sense. It almost constitutes a Hebrew superlative.”¹³

To Ramm’s objection that such a Flood would involve six miles of water because of the height of the Himalayan range¹⁴ and where would such water go afterwards, it has been replied that though there were mountains before the Flood, e.g. Ararat (8:4), there was, as part of the termination of the Flood, a further activity on the part of God in terms of rearing mountains and hollowing valleys. This would re-arrange the water. Psalm 104:6-9 has been quoted in favour of this and in particular verse 8 which should be translated “the mountains rose, the valleys sank down”. However, there is a vast preponderance of evangelical scholarly opinion which regards this as not referring to the Flood, but to the work of God in separating water and dry land on the third day of creation, presented in poetic language. The reference in verse 9 to a boundary set for the water, though evocative of Genesis 9:11, is, nevertheless, implicit in Genesis 1:9, 10. This statement in Psalm 104:8 does not seem sufficiently firm to build a doctrine on by itself, but the possibility cannot be totally precluded.

Further, on this matter of the extent of the Flood, the statements in II Peter 3:6 should be considered. Here the principle of examining the larger context comes to the fore. Peter is here referring to the Flood on the one hand and the End of the World on the other and he declared that the former is paralleled by the latter. The two events are acts of divine judgment. There is also a parallel drawn between them in terms of the longsuffering of God towards sinners prior to each, and the salvation of some in spite of each. In addition, it can be said that a new order was the consequence of each. But is there a parallel established by Peter in terms of the extent of each? J.B. Mayor, Professor of Classics in King's College, London, in the last century, was in no doubt that such was the case, though he expresses his verdict in a rather curious manner. He says:

"It is evident from verses 7, 10 and 12 (which refer to heavens and earth) that the writer looked forward to a fundamental metamorphosis of the existing universe through the final conflagration and this naturally leads him to take an exaggerated view of the Deluge which he regards as a parallel destruction."¹⁵

The world, i.e. the cosmos of II Peter 3:7, though not to be equated with the "heavens and earth" of Verse 6, nevertheless includes them and does so specifically from the aspect of their orderliness. This was devastated by the Flood as the 'order' of the present heavens and the earth together with the world of mankind will be by the Fire. In this way, Peter teaches the universality of the Flood and when the New Testament speaks, the Old must be interpreted accordingly, and, when it is, it is also interpreted accurately.

So, we return to the Genesis account and to Chapter 7. It is worth pointing out that Hebrew prose has no equivalent for "cosmos" in the sense of ordered, physical world. It can, therefore, only speak of the heavens and the earth. There are also hints of the universality of the Flood in Genesis 6-8, apart from Genesis 7:19. It was not only mankind that was to bear the judgment, but all living things on earth (6:7 and 7:23). Animals cannot sin and yet they are included in the judgment. Why? It is on the same basis as the earth is included. Genesis 6:13 reads "I am going to destroy them with (or and) the earth". This cannot be rendered "from the earth". The earth was to be judged because it was, as a result of man, "filled with violence" (6.13). Sin affects and threatens not only mankind's existence, but also his environment. Judgment threatens and affects both — and so does redemptive, restoring grace. Just as the whole world was disordered by the Flood, man, the animals, and the earth, so the covenant of restoration made with Noah extends to each category in the post-diluvian situation (9:1-11). And, a universal sign, the rainbow, witnesses to man and the animals everywhere on the globe of God's promise to never destroy again by a Flood (9:8-17).

III THE EFFECTS OF THE FLOOD

In turning to consider the effects of the Flood, it is still our intention to concentrate on Biblical material. However, with this aspect of our study we come much closer to matters which lie quite properly within the realm of scientific enquiry. We must, therefore, be very careful about what we say the Bible teaches lest we bind believing scientists to a framework for their studies which, not being biblical, is an enemy to true science on the one hand, while exposing the Bible to just ridicule on the other. We shall consider the effects under three headings.

1. The Fossil Record and Man's Longevity

Two effects of the Flood have already been noted, namely the sudden destruction of all human beings with the exception of eight and, in addition, of all non-aquatic creatures. As this was sudden and as life, we have suggested, was widely distributed over the earth's surface, the character of the fossil record can be expected to bear this out.

A further possible effect of the Flood might be the very obvious diminution of man's longevity. In Genesis 5 the ages of the prediluvian patriarchs are recorded. Excluding Enoch, the average age is 912 years. Following the Flood, we come down to about 150 years as between Terah, Abraham, Isaac, Jacob and Joseph. Is this drastic reduction due to the Flood? A definite answer is not easily given. Other possible contributory factors have to be borne in mind such as the lingering effects of Paradise as an environment and the prolongation of procreative powers for the propagation of the race, which powers had been curtailed by the time of Abraham. That the changes brought about by the Flood also effected a reduction of man's life span is a perfectly credible possibility. Perhaps man's environment prior to the Flood was more health-giving even though the Fall had occurred. By Moses' time, the general lifespan had been shortened even more (Psalm 90:10).

The 120 years specified in Genesis 6:3 is not to be regarded as the general post-diluvian lifespan because people did live much longer in that period as Genesis 11 indicates.

2. Climate and Geology

This leads us on to consider the effects (or possible effects) of the Flood on man's environment. These may for convenience be grouped under two heads: climatic and geological.

A. Climate

Genesis 2:5 records that no rain had fallen on the earth and that the surface of the earth had been kept moist by a mist or stream from itself and not water from the sky. As Genesis 2 is not an alternative account of creation, this statement has to be integrated with Chapter 1. It indicates that there was some vegetation which, needing human cultivation, did not appear until after man had been created. The question which for our purposes needs to be asked is "Was there no rain before the Flood?" Does the provision referred to in Genesis 2:6, 10 supply all the moisture necessary for things to grow all over the earth right up to the Flood? It could be argued that it did as no change in this arrangement was made as a result of the Fall, but even Morris and Whitcomb describe this conclusion from the text as "an inference".¹⁶

Now, if no rain fell, then no rainbow was visible and both rain and the rainbow appeared for the first time at the Flood. Genesis 9:13 might appear to confirm this. But the verb there can be rendered "I have set". In that event, what distinguishes the Flood is not rain and the rainbow, but the quantity of water, the uniqueness of its sources, and the new significance attached to the rainbow by the declaration of the Lord. So, though it is a possibility that no rain fell and no rainbow appeared between Creation and the Flood, the text of Genesis is not clear-cut on the issue.

With this may be coupled the reference to a wind in Genesis 8:1. This was instrumental in lowering the level of the water. It is the first reference to a wind in the Old Testament accepting that in Genesis 1:2 the Third Person of the Trinity is in view. It is quite certain, however, that there was such an upheaval caused by the Flood that the pattern of man's existence was disrupted for over a year as is made clear by its re-establishment in the Noahic covenant (Genesis 8:22).

The Phrase "the windows of heaven" is, of course, metaphorical. But that does not mean that it can be dismissed as if it were meaningless. A metaphor says what cannot be said with equal force by a statement. This expression is used in two other passages in the Old Testament, viz. II Kings 7:2 and Malachi 3:10. In both, it is something astounding and abundant that is in view. In that light, what we have in Genesis 7:11 and 8:22 is something unexpected and unparalleled (and unrepeatable?) which transcends a torrential downpour. What happened? Did a vapour canopy collapse? That depends partly on one's view of Genesis 2:5, 6 as to whether it rained before the Flood. The statement in Hebrews 11:7 that Noah was warned by God "about things not seen" does not have to mean that rain was an unknown phenomenon. But another and a more relevant text is surely Genesis 1:7 where waters are stored above the expanse of the firmament. These waters fell "through the windows

of heaven” at the Flood. That was new and had never been seen before.

B. Geology

Two factors have to be considered here. The first is that “the fountains of the great deep were broken up” and the second is that the waters “prevailed” for 150 days on the earth. Taking the second detail first, it is perfectly right to inquire what the geological effects would be of the earth’s being submerged in water for over a year. The absence of any more information in the Bible on this matter is a good example of what should always be intended by the oft-repeated claim that the Bible is not a textbook of science because the Bible does leave room for proper scientific inquiry.

What of the other expression — “the fountains of the great deep?” At the very least it indicates that there were two directions from which water came. The word for “the great deep” is found in Genesis 1:2 which in turn is associated with the waters of Genesis 1:6 which are subsequently divided and stored above the expanse or firmament or lower than the earth. At the flood, there was an upheaval so that the waters lower than the earth were elevated and could rush on over the earth. The Flood was caused by a movement of celestial and subterranean waters under divine intervention and control. Derek Kidner comments on Genesis 7:11 most suggestively:

“The expressions are deliberately evocative of Genesis 1: the waters above and below the firmament are, in token, merged again, as if to reverse the very work of creation and bring back the featureless waste of waters.”¹⁷

Does what these expressions refer to amount to “an entirely adequate explanation for geological formations of every kind as they are now to be observed” as Leupold believes?¹⁸ While we do know that some two thirds of the earth’s rocks are of a sedimentary kind, i.e. they are of rock formed by deposition under water, this matter cannot be *settled* by appeal to Genesis 7:11, 12 alone. Its terms are not sufficiently full to enable that to be done. But they are sufficiently precise to be of the utmost relevance. To try to explain earth’s geological origins solely in terms of present day processes is a serious blunder. For someone who claims to believe the Bible to be the Word of God, to do it is indefensible.

IV THE THEOLOGICAL SIGNIFICANCE OF THE FLOOD

Finally, we turn to consider the theological significance of the Flood and here four things need to be said.

1. The Flood was an Act of God

It was a unique, miraculous event. Perhaps it should have been stated that the Flood in Genesis 6-8 is designated in the Old Testament by a special term “*mabbul*”. There are other Hebrew words for flood, but these are never used of the Flood of Genesis. The only other occurrence of this special term is in Psalm 29:10 where we read “The Lord sat as king at the Flood”. This word is rendered by “*cataclysmos*” in the New Testament and that does not need to be translated into English. It describes the nature of the event. It was not a natural event, though an element of nature (water) was used in its execution. It was a divinely produced event — not in the sense that calamities are termed “acts of God” in insurance policies — but in the sense that it was brought about by His determinate will and executed by His power (Genesis 6:13, 7:14, 8:1). As such, it typifies another event, equally divine in origin and execution, though again an element of nature (fire) will be used which will bring about the end of the world as we know it. That is the Day of the Lord as Peter describes it (II Peter 3:12).

2. The Flood was an Act of God in Judgment

As before the Flood, the Lord saw “how great man’s wickedness on the earth had become, and that every inclination of the thoughts of his heart was only evil all the time” (Genesis 6:5) and so He determined “the end of all flesh”, so the fire will bring about “the day of judgment and destruction of ungodly men” (II Peter 3:7). Longsuffering will end — God’s spirit “will not contend with man for ever” (6:3) — for His longsuffering is not indifferent to evil. The day of the Lord will come, creation and grace notwithstanding, and human arrogance and mockery will be silenced.

3. The Flood was an Act of God in salvation

In the judgment of the Flood, Noah and his family were kept safe and delivered. In the provided ark, they were kept above the waters which destroyed all else. This was because Noah found grace from the Lord and so lived by faith. He was not saved because of his merit. So those who are in Christ by God’s grace to them creating faith in Him will be kept safe too as symbolically attested by baptism (I Peter 3:20, 21).

4. The Flood was an Act of God which brought about a New World

Such were the catastrophic effects of the Flood that, as we have seen, there was need for a new ordering of the world for Noah, his family and the animals to live in. In this way, the Flood prefigures a renovated, but this time eternal, heavens and earth in which righteousness will reside (II Peter 3:13).

The Flood destroyed the ancient world in a comprehensive and terrible act of judgment by God. Yet, in the preserving of Noah and his family in the ark, the saving activity and purpose of God was declared and pursued. This mixing of judgment and mercy will continue to be the pattern of God's dealing with men, so the New Testament teaches, until that event which will be the consummation of judgment on the one hand for many and on the other of salvation for many more, together with the end of the present world order which is passing away and the inauguration of the permanent, eternal order which is approaching.

Bibliography

1. Davis, J.D. *Genesis and Semitic Tradition*. Scribner, 1894 Reprinted Baker, 1980.
Heidel, A. *The Gilgamesh Epic and Old Testament Parallels*. University of Chicago Press, 1949.
2. Filby, F.A. *The Flood Reconsidered*. Pickering and Inglis, 1970.
3. Filby F.A. *op. cit.*, pp. 55-56.
4. Kidner, Derek *Genesis, An Introduction and Commentary*. Tyndale Press, 1967, p. 97.
5. Kidner, Derek *op. cit.*, p. 99.
6. Ramm, Bernard *The Christian View of Science and Scripture*. Paternoster, 1964, p. 158.
7. Kline, Meredith *Genesis - New Bible Commentary Revised*. IVP, 1970.
8. Kidner, Derek *op. cit.*
9. Mitchell, T.C. Article on The Flood in *New Bible Dictionary*, IVP, 1962.
10. Mitchell T.C. *op. cit.*, pp. 427-428.
11. Young, E.J. *An Introduction to the Old Testament*. Tyndale Press, 1958, p. 59.
12. Ramm, Bernard *op. cit.*, p. 164.
13. Van Gemeren, W.A. "The Sons of God in Genesis 6:1-4" *Westminster Theological Journal*, XLIII, No. 2.
14. Leupold H.A. *Exposition of Genesis*. Evangelical Press, 1982, p. 301.
15. Ramm, Bernard *op. cit.*, p. 166.
16. Mayor, J.B. *The Epistle of Jude - The Epistle of II Peter*. Klock & Klock, 1978, p. 153.
17. Morris, H.M. and J.C. Whitcomb, *The Genesis Flood*. Evangelical Press, 1961, p. 241.
18. Kidner, Derek *op. cit.*, p. 91.
19. Leupold, H.C. *op. cit.*, p. 296.

Biochemistry Seminar Paper
STEROID HORMONES AND EVOLUTION

D.B. Gower

Classical evolutionary theory has been concerned with the comparison of gross structural features of living organisms and fossil remains and arguments have then been presented in terms of the principle of homology (i.e. similarities see A. Jones, BC 5.16, 112-7). With the rapid growth of biochemical knowledge, there is now great interest in pursuing these issues with reference to the molecular constituents of the living cell. This paper focuses upon one particular group of cell components, the steroids, hormones which function as regulators of physiological processes in vertebrates and invertebrates. Structurally these molecules contain carbon atoms in a system of rings, three six-membered and one five-membered, fused together (six atoms being shared between rings). The chemical variations additional to this basic pattern yield a surprising diversity of physiological function. Thus analyses of the steroid distributions among living organisms are of great importance. Contrary to the expectation of general evolutionary theory, molecular structures and associated types of biosynthetic modification of steroid hormones do not display significant patterns of development in the animal kingdom. Rather, the impression obtained from recent study is that steroid hormones are universal biomolecules present at all phylogenetic levels.

I. Introduction.

It is generally considered that biologically important compounds found in fish and animals must have themselves evolved, that is, become more complex, as the fish or animals have evolved. This would imply that, perhaps at some time in the past in a very primitive species of animal, a particular group of biologically important compounds was absent later to appear in another species. This line of reasoning would imply further that certain enzymes necessary for the formation of the compound in question were absent in the primitive animal but evolved and became functional in the complex. This paper is a brief review of the kinds of steroid hormones present in the most simple organisms as well as in more highly developed creatures including man, to see if there are any changes which could be suggestive of an evolutionary sequence.

II. Structures and biological actions of steroid hormones.

The chemistry of the steroid hormones has been described in numerous publications (e.g. Kellie, 1984) and only a brief review will be attempted here. The compound from which the steroid hormones are derived biosynthetically is cholesterol, a steroid that was originally isolated from gall-stones. The parent compound of cholesterol (which contains 27 carbon atoms, designated C_{27}) is the hydrocarbon cholestane (Fig. 1). This consists of four hydrocarbon rings fused together, three of them (rings A, B and C) are six-membered while the fourth (ring D) is five-membered. In addition, the compound contains two methyl (CH_3) groups, attached at carbon numbers 10 and 13 (designated C-10 and C-13) and a C_8 side-chain attached at C-17.

Fig. 1 Structures of cholestane and cholesterol.

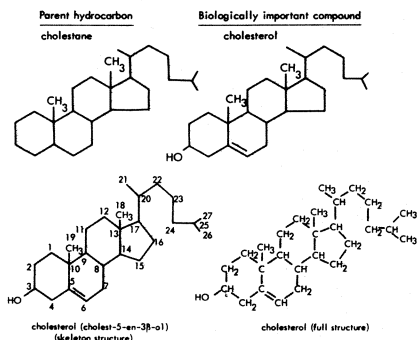
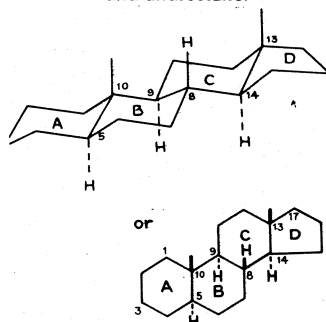


Fig. 2 Three-dimensional structure and androstane.



In this paper, the abbreviated structure for cholesterol and other steroids will be used (Fig. 1), which shows two more structural features (a) an hydroxyl ($-OH$) group at C-3 and (b) a double bond in ring B between C-5 and C-6. The three-dimensional structure of the steroids is exemplified by the hydrocarbon androstane (Fig. 2) in which the cyclohexane rings A, B and C are of the 'chair' type. The free valencies of the carbon atoms are also shown in the diagram; those at right angles to the plane of the ring are called axial (a), those in the plane are called equatorial (e).

When most of the side-chain of cholesterol is removed by biosynthetic reactions within the steroid hormone-producing tissues, the C_{21} steroids are formed. The parent hydrocarbon related to these is pregnane (Fig. 3) and typical examples of the group are the corticosteroids, cortisol, cortisone and aldosterone and the progestogen, progesterone. Cortisol and cortisone are members of a sub-group called the glucocorticosteroids (glucocorticoids) because they exert powerful effects on glucose and protein metabolism, while aldosterone is the most potent mineralo-corticoid, being concerned with the balance of sodium and potassium ions and of water in human beings and animals.

Fig. 3 Structures of some C_{21} steroids.

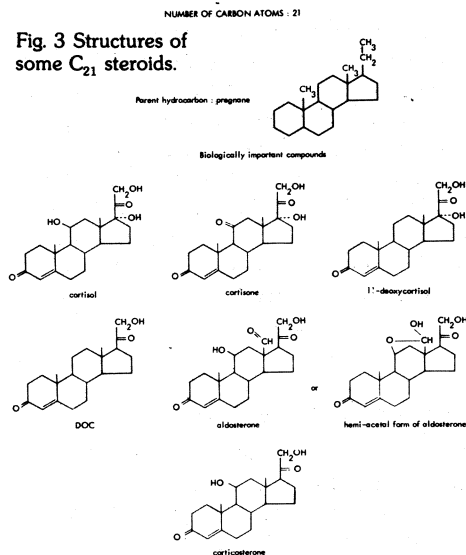
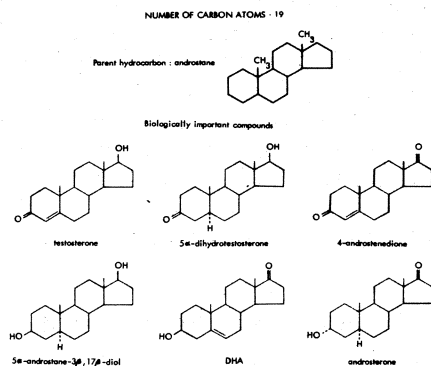


Fig. 4 Structures of some C_{19} steroids.



The second major group of steroid hormones are the androgens, notable examples of which are testosterone and 5α -dihydrotestosterone. These are all characterized by a C_{19} structure (Fig. 4) and are formed mainly in the testes and also in the ovaries and adrenals. They control the growth and development of the male secondary sexual organs and male sexual characteristics, such as body hair distribution and deepening of the voice.

The third group are the oestrogens (Fig. 5), characterized by C_{18} structures which lack the angular methyl group at C-10 and possess a planar, aromatic ring A. The most potent oestrogen is oestradiol- 17β , with oestriol and oestrone being somewhat less active. They are formed largely in the ovaries and concerned with the female sexual characteristics, such as breast development and distribution of sexual hair.

Fig. 5 Structures of some C_{18} steroids.

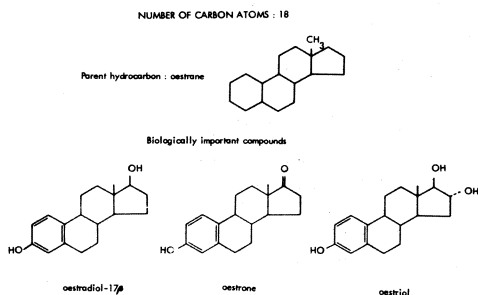
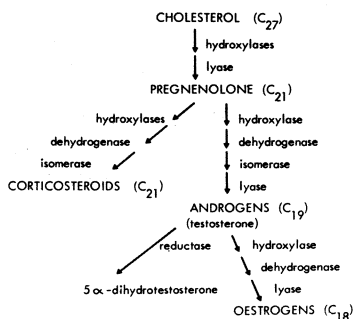


Fig. 6 Outline of the reactions involved in steroid hormone biosynthesis.

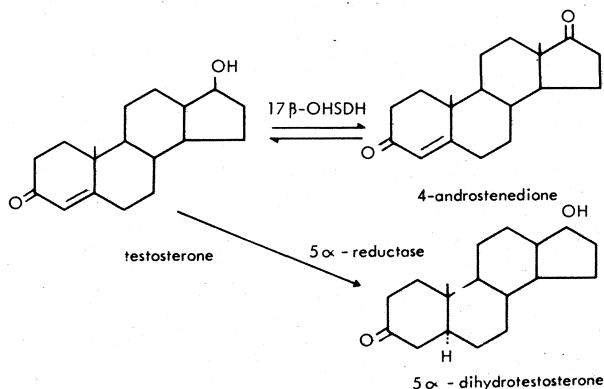


As indicated earlier, the biosynthesis of the corticosteroids, androgens and oestrogens occurs from the parent compound, cholesterol (a C_{27} steroid). The details of these reactions and of the enzymes involved have been reviewed recently (Gower, 1984; Schulster *et al.*, 1976) and only a summary is included in Fig. 6. First, the side-chain is hydroxylated and then a C_6 fragment cleaved to give the C_{21} group of steroids. Further hydroxylations and movement of double bonds (all enzymically controlled) result in the corticosteroids. Next, the side-chain is removed completely by an oxidative step to yield the androgens (C_{19} steroids) and finally through another complex series of reactions, the C-10 angular methyl group is removed with the formation of oestradiol- 17β from testosterone while androstenedione gives rise to oestrone.

III Possible evolution of steroid-transforming enzymes.

Before coming to a survey of the steroid hormones throughout the animal kingdom, it will be relevant to consider two of the enzymes involved in androgen metabolism. As mentioned in the Introduction, evolutionary reasoning implies that certain enzymes necessary for the formation of a biologically-important compound were absent in a more primitive animal but evolved and became more functional in the more complex. Let us suppose that a primitive animal was prepared to possess the weak androgen, androstenedione (Fig. 7) but that a more modern creature required the more potent androgens, testosterone and especially, 5α -dihydrotestosterone — thought now to be the active form of testosterone in target organs. Such a situation would require the synthesis or, at least, the increasing activity, of the 17β -hydroxysteroid dehydrogenase to convert androstenedione to testosterone and the 5α -reductase to convert the latter to 5α -dihydrotestosterone. On evolutionary grounds, it has been postulated how enzymes might have evolved in order to fulfil their catalytic roles in more 'modern' creatures.

Fig. 7 Metabolism of testosterone (17β -OHSDH, 17β -hydroxysteroid dehydrogenase).



Evolutionary theory proposes that mutations arose by chance and that those which conferred in their recipients some increase in biological fitness have persisted. A mutation implies a change of a single amino acid in a polypeptide chain and this, in turn, implies a change in a single nucleic base in the DNA coding. Watts (1965) has suggested that such a mutation might modify enzyme activity in a number of possible ways. One could be that the substrate binding sites might undergo change without totally impairing function, thus giving rise to new enzymes with new specifications. In other words, a single mutation might result in the production of an enzyme which could bind to a different substrate and therefore possess different properties. Watts & Watts (1968), subsequently modified their proposals by writing

"... to convert a protein to a new function or to adapt it to existence in a changed environment must, in general, require a number of mutations". Is it possible, then, to discover any changes in the kind of steroid hormones in different species, or, more specifically, is there evidence that the weak androgen androstenedione is present in (say) the invertebrates later to appear in the more potent form testosterone in some vertebrate species?

IV Distribution of Steroid Hormones throughout Animal Kingdom.

During the past two decades, numerous invertebrate and vertebrate species have been examined for content of endogenous steroid hormones and for biosynthetic capabilities. Table 1 contains a selection of the mass of data published in reviews and books. Several invertebrate species, including cuttlefish, mussel, sea-urchin and starfish, have been studied and found to contain corticosteroids, androgens and oestrogens (Gottfried, 1964; Tammar, 1970). Furthermore, the biosynthesis of such hormones occurs (Breuer & Ozon, 1965), clearly indicating the presence of steroid-producing enzymes in invertebrates.

Table 1.

Distribution of Steroid Hormones throughout the Animal Kingdom			
Invertebrates. Species	Corticosteroids	Androgens	Oestrogens
<i>Sepia officinalis</i> (cuttle fish)	corticosterone, cortisol.	T, A, DHA	
<i>Mytilus edulis</i>	corticosterone, corticosterone cortisol.	T, A.	Oe ₂ , Oe ₁
Sea urchin		T.	Oe ₂
Starfish	corticosterone, cortisol	T	Oe ₂

Biblical Creation 6:17

Vertebrates.			
Atlantic hagfish	corticosterone cortisol cortisone		Oe ₂
Pacific hagfish	corticosterone cortisol		
Sea lamprey	corticosterone cortisol cortisone	Oe ₂ , Oe ₁	
Lake lamprey	corticosterone cortisol	T, A.	
Stingray	corticosterone		
Greater spotted dogfish	corticosterone DOC	T, A.	Oe ₂ , Oe ₁
Pacific spiny dogfish	corticosterone DOC, aldosterone	T	Oe ₂ , Oe ₁
N. Atlantic spiny dogfish	corticosterone DOC, aldosterone	T, A, DHA, androstosterone	Oe ₂ , Oe ₁
Skate	corticosterone DOC	T	Oe ₂
Electric ray	corticosterone cortisol cortisone, DOC	T	Oe ₂ , Oe ₃
Sturgeon	corticosterone cortisol, cortisone		
Cod	cortisol	Oe ₂ , Oe ₁	
Carp	cortisol	T	Oe ₂ , Oe ₃ 16-EpiOe ₃
Sockeye Salmon	corticosterone cortisol cortisone	T, A. 11-oxo T	Oe ₂ , Oe ₁
Frog	corticosterone DOC, aldosterone	T and reduced derivatives	Oe ₂
Common toad	corticosterone aldosterone		Oe ₂ , Oe ₁ , ? Oe ₃
South African clawed toad	cortisol	T and reduced derivatives	Oe ₂ , Oe ₁
Giant salamandar	corticosterone DOC, aldosterone	A	
Snake	corticosterone cortisone aldosterone	A, DHA	
Snake	corticosterone cortisol		
Lizard	corticosterone	A, T, DHA	Oe ₂ , Oe ₁
N. American turtle	corticosterone cortisol aldosterone		

Domestic hen	corticosterone DOC, aldosterone	T, A	Oe ₂ , Oe ₁ , Oe ₃
Domestic duck	corticosterone DOC, aldosterone	T, A	Oe ₁ , Oe ₂
Pigeon	corticosterone	T, A	Oe ₂ , Oe ₁ Oe ₃ , EpiOe ₃
Rhesus monkey	corticosterone cortisol, DOC aldosterone	T, A	
Dog	corticosterone cortisol cortisone aldosterone	T, A, DHE	Oe ₁ , Oe ₂
Guinea-pig	corticosterone DOC, cortisol cortisone aldosterone	T, A, DHA	Oe ₁ , Oe ₂
Rat	corticosterone DOC, aldosterone 18-OH-corticosterone	T, A, DHA	Oe ₁ , Oe ₂
Mouse	corticosterone cortisol aldosterone	T, A, DHA	Oe ₁ , Oe ₂
Rabbit	corticosterone DOC, cortisol cortisone 18-OH-corticosterone	T, A, DHA	Oe ₁ , Oe ₂
Man	cortisol corticosterone DOC, aldosterone cortisone 18-OH-corticosterone	T, A, DHA androsterone	Oe ₂ , Oe ₂ , Oe ₃

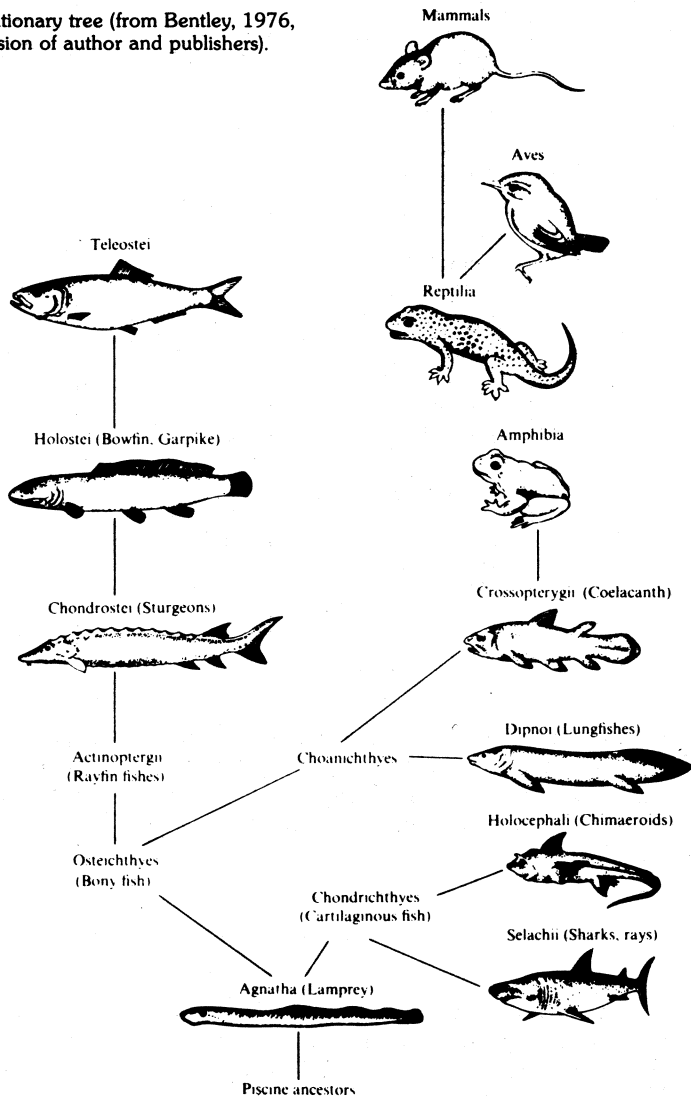
Notes

Data are obtained from Idler & Truscott (1972), Ozon (1972a, b), Sandor *et al* (1975, 1976), Vinson & Whitehouse (1970). Only a selection of results and the principal steroids are included. DOC, deoxycorticosterone; T, testosterone; A, androstenedione; DHA, dehydroepiandrosterone; Oe₁, oestrone; Oe₂, oestradiol-17 β ; Oe₃, oestriol.

Endogenous steroids and steroid biosynthesis and transformations have been shown to occur also in higher plants, such as *Digitalis purpurea* and *Pinus silvestris* (Lehoux & Sandor, 1970) and in lower plants such as Algae (Sandor *et al.*, 1975). In addition, steroid biosynthesis has been demonstrated in numerous strains of bacteria. In this connection, various species of

cytochrome P-450 have been isolated which play an important role in side-chain cleavage and hydroxylation reactions so necessary in the biosynthesis of steroid hormones from cholesterol (for review, see Sandor *et al* 1975).

Fig. 8 Evolutionary tree (from Bentley, 1976, with permission of author and publishers).



When the vertebrates are considered, there is even more evidence for steroid hormone production. The data in Table 1 are arranged in a phylogenetically ascending manner, i.e. invertebrates to non-mammalian vertebrates to mammalian vertebrates. Fig. 8 shows a typical evolutionary tree (Bentley, 1976) which should be studied in conjunction with Table 1. Primitive fishes are thought to have given rise to Class Agnatha, comprising Myxina (Hagfish) and Lampetra (Lampreys) and these to both Class Chondrichthyes (the elasmobranchs such as rays, skate, dogfish), and to Class Osteichthyes (bony fish). However, there is no evidence whatsoever for the evolution of steroid hormones or of the steroid-transforming enzymes in fish. All contain one or more of the corticosteroids, androgens such as testosterone and oestrogens like oestradiol-17 β or oestrone. Of particular interest is a review published by Henderson *et al.*, (1975) which involved a study of the steroids in 150 species of teleost fish, comprising tiny tropical fish to giant tunnyfish and living in environments as different as the Antarctic, fresh water lakes or the brine swamps of the Dead Sea. The authors concluded that "No phylogenetic trends have been observed; cortisol is the major adrenal steroid, with cortisone, corticosterone and aldosterone".

When Amphibia, reptiles, birds and mammals (including man) are considered, an almost exactly similar picture is obtained. Vinson and co-workers (1975) state that "the secretion of testosterone may be a normal function of the adrenal cortex throughout the mammals."

In summary, it is no under-statement to say that the study of steroid hormones in various species is an embarrassment to evolutionary theory. Tammar (1970) concludes as follows "The study of distribution of steroid hormones in vertebrates seems to be of little value to the taxonomist. Although their functions may have altered, the molecules and their biosynthetic pathways have apparently been established for a long time. There is no evidence of any evolution of steroids, despite the evolution of the organisms in which they are encountered". Writing in similar vein, Lehoux & Sandor (1970) state "There is not much doubt that all living matter can produce and/or metabolize steroids — even microbes and plants. From an evolutionary point of view, one must admit that steroidogenesis is not an exclusive attribute of the vertebrates". More recently, Sandor & Sonea (1975) found that testosterone and androstenedione are the principal androgens of all vertebrate male gonads; and progesterone, oestradiol of all vertebrate female gonads (Ozon, 1972 a, b). "Thus adrenal and gonadal secretory patterns do not follow any evolutionary trends" (Sandor & Sonea, 1975). Furthermore, at the molecular level, the intracellular enzyme distribution in vertebrate adrenal and gonadal cells is essentially identical in all Classes, i.e. the oxidative cleavage of cholesterol, hydroxylations, etc., (see Fig. 6) are accomplished in all Classes.

Steroids, then, appear to be universal biomolecules, present at all phylogenetic levels and, furthermore, present from the beginning.

V. Steroid hormone receptors.

During the last few years the emphasis has changed with regard to steroid hormones and evolution. It is now considered as a working hypothesis by many researchers that the hormonal role of steroids, the "very ancient bioregulators", came about by the evolution of receptors to those steroids (Sandor *et al.*, 1975), rather than of the steroids themselves. A great deal is now known about receptors to the various steroid hormones and a detailed account is beyond the scope of this paper. Briefly, receptors, which are entirely, or largely, protein in nature, occur in the cytoplasm of target tissues. The steroid concerned enters the cell, binds to the cytoplasmic receptor and is then transported to the nucleus where, in many cases, a different nuclear receptor binds with the steroid, while the cytoplasmic one returns to the cytoplasm. The steroid then binds to the DNA and stimulates RNA polymerase activity and messenger-RNA synthesis, thereby increasing specific enzyme activity. For a popular account of receptors and steroid hormone action, the reader is referred to O'Malley & Schrader (1976).

In 1966, Fox & Harada succeeded in synthesizing "proteinoids" from the thermal polymerization of aminoacids under simulated prebiotic conditions, and discovered that these had the ability to bind corticosterone. More recently, Sandor and co-workers (1975) show that oestradiol-17 β could be bound by a purified "proteinoid". On the basis of such evidence they speculate that steroids, bound to "proteinoids" provided a primitive template upon which new proteinoids were synthesized by enzymic means. The authors admit, however, that there is no evidence for any such synthesis in the absence of genetic material. Furthermore, even if "receptor proteinoids" can be synthesized under laboratory conditions, it is purely speculative to assume that they could have been formed in the primitive earth. Such laboratory experiments, performed under "prebiotic" conditions have been vigorously criticised by Gish (1972) and by Cowell (1977) and their cogent arguments will not be repeated here. Finally, there is not the slightest evidence for formation of the cholestane nucleus (the parent of the steroids) in 'prebiotic' experiments (Sandor & Sonea, 1975), thus the possibility that steroid hormone-receptor complexes could have formed by chance in the beginning is so remote as to be impossible. This, together with the lack of phylogenetic trends with respect to the steroid hormones, argues most strongly against evolutionary theory.

References

- Bentley, P.J. (1976) "Comparative vertebrate endocrinology" Cambridge Univ. Press.
- Bruer, H. & Ozon, R. (1965) *Arch. Anat. Microscop. Morphol. Exptl.*, 54, 17 (Chem. Abstract 63, 13742e).
- Cowell, D.B. (1977) "The Origin of Life", Newton Scientific Association Report, London.
- Fox, S.W. & Harada, K. (1966) "A laboratory manual of analytical methods of protein chemistry", Vol. IV; Eds. P. Alexander & H.P. Lundgren, Pergamon Press, Oxford, pp. 127-151.
- Gish, D.T. (1972) "Speculations and experiments relating to theories on the origin of life — a critique" I.C.R. Publishing Co., San Diego, California.
- Gottfried, H. (1964) *Steroids* 3, 219-242.
- Gower, D.B. (1984) In "Biochemistry of Steroid Hormones", Ed. H.L.J. Makin, Blackwell Scientific Publications, Oxford, 2nd edn. (in the press).
- Henderson, I.W. Jackson, B.A. & Hargreaves, G. (1975) *Biochem. Soc. Trans.*, 3, 1168-1171.
- Idler, D.R. & Truscott, B. (1972) In "Steroids in non-mammalian vertebrates", Ed. D.R. Idler, Acad. Press, pp. 126-252.
- Kellie, A.E. (1984) in "Biochemistry of Steroid Hormones", Ed. H.L.J. Makin, Blackwell Scientific Publications, Oxford, 2nd edn. (in the press).
- Lehoux, J.G. & Sandor, T. (1970) *Steroids*, 16, 141-171.
- O'Malley, B.W. & Schrader, W.T. (1976) *Scient. Amer.* 234, 32-43.
- Ozon, R. (1972a) In "Steroids in non-mammalian vertebrates", Ed. D.R. Idler, Acad. Press, pp. 328-389.
- Ozon, R. (1972b) In "Steroids in non-mammalian vertebrates", Ed. D.R. Idler, Acad. Press, pp. 390-413.
- Sandro, T., Sonea, S. (1975) *Biochem. Soc. Trans.*, 3, 1157-1159.
- Sandor, T., Sonea, S., & Mehdi, A.Z. (1975) *Amer. Zool.*, 15 (Suppl. 1), 227-253.
- Sandor, T., Fazekas, A.G. & Robinson, B.H. (1976) In "General, comparative and clinical endocrinology of the adrenal cortex", Vol. 1; Eds. I Chester Jones & I.W. Henderson, Acad. Press, pp. 25-142.
- Schulster, D., Burstein, S. & Cooke, B.A. (1976). "Molecular endocrinology of the steroid hormones", John Wiley & Sons, London, New York, Sydney, Toronto, pp. 49-72.
- Tammar, A.R. (1970) "A comparative study of steroids with special reference to bile salts". Ph.D. Thesis, University of London.
- Vinson, G.P. & Whitehouse, B.J. (1970) In "Advances in Steroid Biochemistry and Pharmacology" Vol. 1 Ed. M.H. Briggs, Acad. Press, pp. 163-342.
- Vinson, G.P., Bell, J.B.G., Renfree, M.B. & Whitehouse, B.J. (1975) *Biochem. Soc. Trans.* 3, 1171-1175.
- Watts, D.C. (1965) In "Studies in Comparative Biochemistry" Ed. K.A. Munday, Pergamon Press, Oxford, p. 159.
- Watts, R.L. & Watts, D.C. (1968) *Nature*, Lond., 217. 1125-1130.

NEWS! NEWS! NEWS! NEWS! NEWS! NEWS! NEWS! NEWS! NEWS!

1984 "CREATION AND ORIGINS" STUDY CONFERENCE

23-26 July, 1984,

High Leigh Conference Centre, Hoddesden, Herts.

Speakers include: Prof. Edgar Andrews, Dr. Chris Darnbrough, Gerald Duffett, Dr. David Gower, Rev. Gordon Keddie, Dr. John Peet, David Tyler, Paul Verscheuren, Dr. David Walton and Dr. David Watts. Wednesday 25th July will be an Open Day.

Begin to plan now to attend "High Leigh" in '84.

Dr. Duane Gish on the 'Age of the Earth'

There is no uniformly-held age of the earth among scientific creationists. As Dr. Duane Gish (Ph.D., University of California, Berkeley, biochemistry) stated on ABC Nightline, December 9th, 1981: "If you . . . ask me how old . . . this earth is . . . , I would say that the scientific data . . . would accommodate an age anywhere from 10,000 years plus or minus a few thousand years up to 10 billion years. It lies somewhere within that range, depending on the method you choose to use, the assumptions that you make and so forth . . . Now there are a number of processes, good physical chronometers, which if the assumptions of the method are correct . . . would indicate that our universe and the earth itself could not be older than in some cases thousands of years . . . And so I believe that there is scientific evidence to indicate that things could be young. But I have to admit that the evidence is equivocal and furthermore, I want to make this important point, that our scientific case for creation does not rest on any particular age for the earth. To imply Bishop Usher's chronology or any other authoritarian view to all creationists or creationism in general is nothing short of cheap emotional chicanery."

The quotation from Dr. Gish was first published in an article by A. James Melnick in the May 1982 Newsletter of Intellectual Freedom published by the American Library Association.

Biblical Creation is published three times a year by the
Biblical Creation Society

President Prof. Edgar Andrews, *University of London*
Vice-Presidents Randal Macaulay, *L'Abri*
 The Revd Geoffrey Thomas, *Aberystwyth*
 Prof. Verna Wright, *University of Leeds*
 The Revd Dr Nigel Cameron, *Edinburgh*.

More information about the Society may be obtained from the Secretary

Editorial matter should be addressed to Dr. D.C. Watts

Subscription enquiries should be addressed to the
Administrative Officer

Subscriptions

UK: £3.00/£2.00*

Europe: £3.50/£2.50*

Outside Europe — surface: £3.50/£2.50*

Outside Europe — airmail: £6.00/£5.00*

Single Issue — £1.00

* In each case the lower rates apply to undergraduate students, missionaries and the registered unemployed.

The dollar rate for those in North America is:

US \$14 for airmail

US \$11 for surface

Dollar-cheques should, for the time being, continue to be made payable to
'Dr. D. Lachman' and be sent to Dr. D. Lachman

ISSN 0260-9460

Typeset and Printed by Campsie Marketing